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HYDRO-ELECTRIC INQUIRY COMMISSION

ENGINEERING DATA

THE QUEENSTON-CHIPPAWA POWER DEVELOPMENT

CHAPTER "J"—QUANTITIES

SUMMARY

WALTER J. FRANCIS & COMPANY

CONSULTING ENGINEERS

Chapter J.

QUANTITIES

(Summary)

Walter J. Francis

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INDEX TO CHAPTER J.

Summary

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INDEX TO CHAPTER J.

Summary

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LIST OF ILLUSTRATIONS

Summary

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Chapter J.

QUANTITIES

Walter J. Francis

The first part of Chapter J, being pages J-1 to J-45 inclusive, refers to quantities in the right-of-way. The second part, being pages J-46 to J-99 inclusive, refers to temporary buildings and commissariat for construction. The third part, being pages J-100 to J-172 inclusive, deals with bridges and crossings. The present portion is devoted to a summary of the quantities of the principal elements and classifications completed at March 31st, 1922.

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SUMMARY

General.

In the following tabulation are shown the totals of the quantities as at March 31st, 1922, classified under the various subdivisions of the work, while on pages J-175, J-176 and J-177 may be found explanatory notes indicated by reference numbers corresponding to those in the first column of the tabulation.

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(J-174)

Classification	Quantity
Intake:	
(1) Sheet piling	187,089 lin. ft.
(2) Earth in temporary dams	139,120 cu. yds.
(3) Earth excavation	537,067 cu. yds.
Welland River:	
(4) Earth excavation	1,194,637 cu. yds.
Canal:	
Earth excavation:	
(5) Canal ..... 9,651,557 cu. yds.	
(6) Construction railways .... 567,453 cu. yds.	
Total earth excavation	10,219,010 cu. yds.
Rock excavation:	
(7) Canal ..... 3,841,247 cu. yds.	
(8) Construction railways .... 25,071 cu. yds.	
Total rock excavation	3,866,318 cu. yds.
(9) Dredging	1,256,068 cy. yds.
(10) Concrete	304,299 cu. yds.
(11) Structural steel, control gate	Contract
(12) Rip-rap	986,028 cu. yds.
Forebay:	
(13) Earth excavation	49,082 cu. yds.
(14) Rock excavation	473,590 cu. yds.
(15) Concrete	6,440 cu. yds.
Screen House:	
(16) Earth excavation	1,526 cu. yds.
(17) Rock excavation	43,470 cu. yds.
(18) Reinforced concrete	29,522 cu. yds.
(19) Structural steel	Contract
(20) Steel for racks, gates and ice chute	1,449,826 pounds
Penstocks:	
(21) Rock excavation	17,836 cu. yds.
(22) Concrete	9,025 cu. yds.
(23) Steel work	1,833,350 pounds

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Classification	Quantity
Power House and Tail-race:	
(24) Earth excavation	22,790 cu. yds.
(25) Rock excavation	334,596 cu. yds.
(26) Concrete	38,584 cu. yds.
(27) Structural steel	Contract
Hydraulic machinery:	
Johnson valves	Contract
Turbines and auxiliary equipment	Contract
(28) Electrical generation and proportion of Superstructure	See Note
Bridges:	
Temporary structures, actual cost	$485,466.03
Permanent structures	See Note
Right-of-way	3,540 acres

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Explanatory Notes Regarding Quantities.

(1) - The steel sheet piling, amounting to 187,089 lin. ft., was used in the two temporary dams at the intake. It was standard Lackawanna steel sheet piling.

(2) - The earth in the temporary dams amounted to 139,120 cubic yards. It came from the general excavation and was deposited on either side of the steel sheet piling. The quantity includes 3,248 cu. yds. of rubble placed in temporary dam cribwork.

(3) - The earth excavation, amounting to 537,067 cubic yards, was the general excavation on the site of the intake.

(4) - The earth excavation in the Welland River amounted to 1,194,537 cubic yards. Of this quantity, 62 per cent. was excavated by the Lidgerwood cableway, 37 per cent. by the dredge "Boone" and 1 per cent. by the dredge "Cyclone", all performed in deepening and improving the natural channel of the river between the intake and the entrance to the canal proper.

(5) - The earth excavation in the canal proper amounted to 9,651,557 cubic yards, apart from secondary excavation for the construction railways.

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The earth excavation comprised the dry excavation in the earth portion and the overburden throughout the rest of the canal, but did not include the wet excavation taken out by the dredge "Cyclone".

(6) - The earth excavation for construction railways amounted to 567,453 cubic yards, and comprised such earth work as was done over the development for construction railways proper.

(7) - The rock excavation in the canal amounted to 3,841,247 cubic yards, and consisted of the rock work in the prism of the canal - including over-break and scaling, in the foundations for the control gate and in wall foundations.

(8) - The rock excavation for the construction railways amounted to 25,071 cubic yards, and comprised such rock work as was done over the development for construction railways proper.

(9) - The dredging in the canal amounted to 1,256,068 cubic yards and comprised that portion of earth taken out under water, principally by the dredge "Cyclone", in the portion of the canal between the Welland River and the commencement of the rock section.

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(10) - The concrete in the canal amounted to 304,299 cubic yards, and was placed on the floor, along the sides of the rock section, in the walls, and in the substructure of the control gate.

(11) - The structural steel in the control gate was let in a single contract, as referred to in Chapter G.

(12) - The total amount of rip-rap was 986,028 cubic yards, and comprised that portion of spoil from the rock excavation which was deposited along the sides of the canal to retain the unstable earth banks, and to form the fill at the crossing of Bowman's Gully and the base for the concrete lining on its slopes.

(13) - The earth excavation in the forebay amounted to 49,062 cubic yards, and consisted of the overburden of earth in the forebay area.

(14) - The rock excavation in the forebay amounted to 473,590 cubic yards, and comprised the whole of the rock in the forebay proper.

(15) - The concrete in the forebay amounted to 6,440 cubic yards, and consisted of the concrete in the diffuser and the gunite where used on the exposed rock surfaces.

(16) - The earth excavation in the screen house amounted to 1,526 cubic yards, being the overburden on the rock at the screen house.

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(17) - The rock excavation in the screen house amounted to 43,470 cubic yards and comprised the rock excavation for the substructure. The line of demarkation between the screen house and the penstocks is taken as the easterly limit of the substructure of the screen house.

(18) - The reinforced concrete in the screen house amounted to 29,522 cubic yards, and consisted of the complete substructure. As reinforcing had been used fairly generally, no attempt has been made to differentiate between mass and reinforced concrete.

(19) - The structural steel in the screen house was let by contract, being manufactured and delivered for a lump sum. The erection was subsequently performed by day work.

(20) - The steel used for racks, gates and ice chute amounted to 1,449,826 pounds, and consisted of the guides and heavy imbedded steel work, as well as movable parts.

(21) - The rock excavation for the penstocks amounted to 17,836 cubic yards and comprised all the rock excavation therefor, from the easterly limit of the substructure of the screen house to the face of the escarpment.

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(22) - The concrete in the penstocks amounted to 9,025 cubic yards, being all the concrete used in connection with the penstocks from the easterly limit of the substructure of the screen house to the end of the penstocks at the junction with the Johnson valves.

(23) - The steel work in the penstocks amounted to 1,833,350 pounds and comprised all the rivetted plate work in the penstocks erected up to March 31st, 1922.

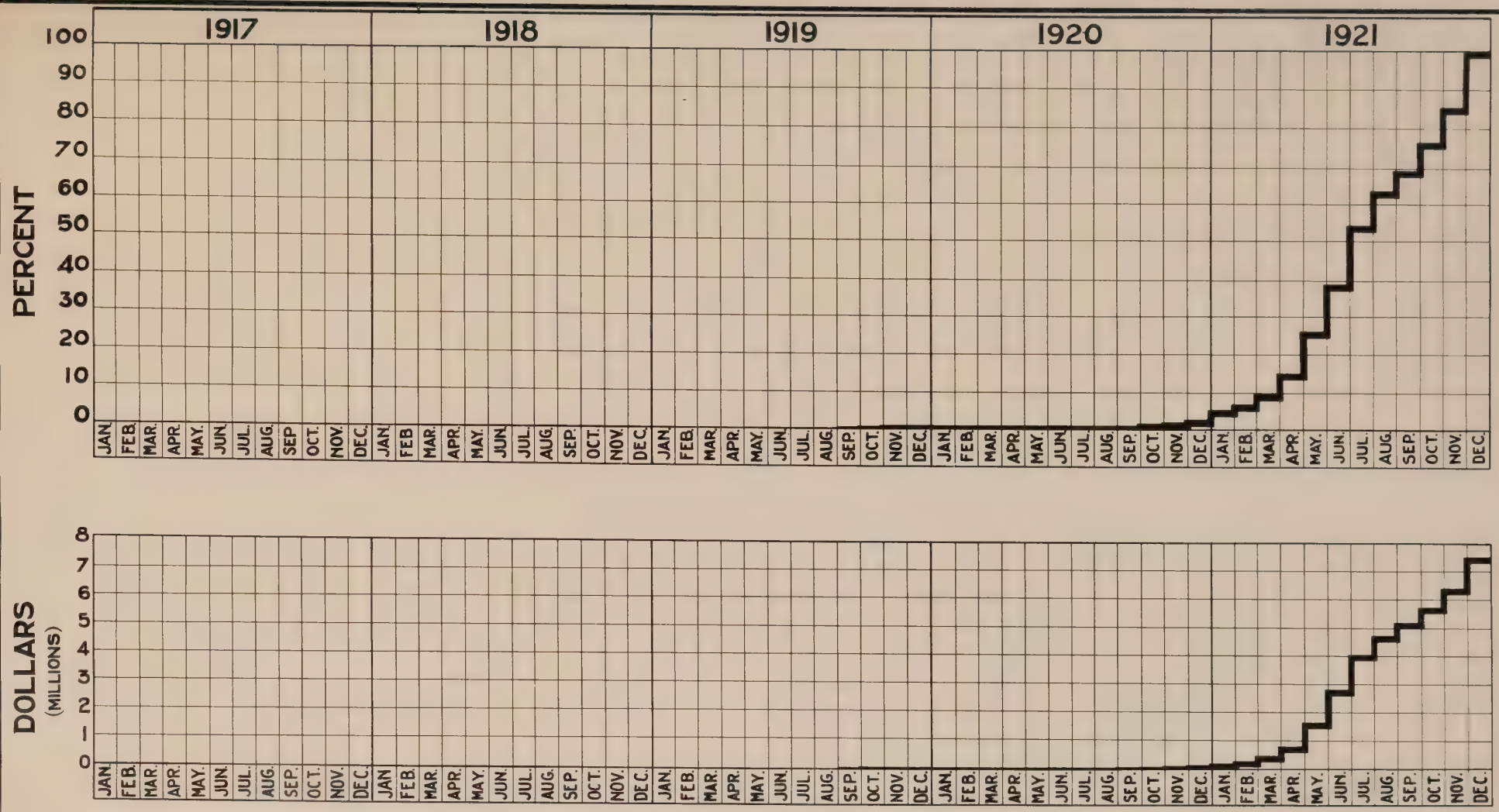
(24) - The earth excavation in the power house and tail-race amounted to 22,790 cubic yards, and consisted principally of loose overburden on the site of the power house.

(25) - The rock excavation in the power house and tail-race amounted to 334,896 cubic yards and comprised all the rock excavation at the power house.

(26) - The concrete in the power house amounted to 38,564 cubic yards and comprised all the concrete in the substructure up to the operating floor of the generator room.

(27) - The structural steel in the power house was manufactured and delivered under contract, and subsequently erected by day work. See Chapter G.

COPY



HYDRO-ELECTRIC INQUIRY COMMISSION

W. D. GREGORY, CHAIRMAN

QUEENSTON-CHIPPAWA POWER DEVELOPMENT

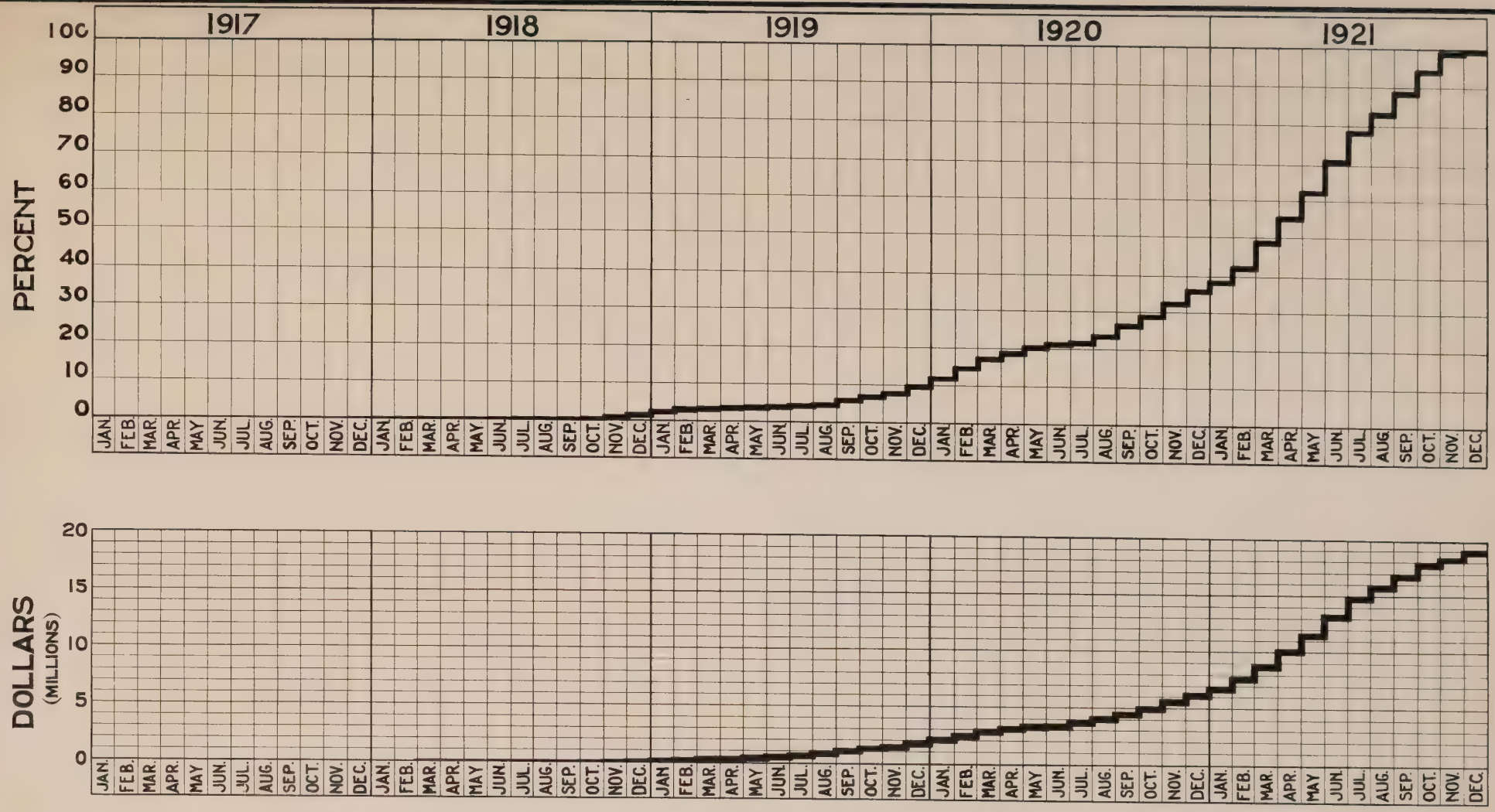
PROGRESS CHART FOR CONCRETE WORK IN CANAL AND FOREBAY

Toronto, May 3rd, 1923. Made by W.E.D. Checked by W.D.G.

WALTER J. FRANCIS & COMPANY

CONSULTING ENGINEERS

(J-183)



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QUEENSTON-CHIPPAWA POWER DEVELOPMENT

PROGRESS CHART FOR ROCK EXCAVATION IN CANAL, FOREBAY AND POWER HOUSE

Toronto, May 3rd, 1923. Made by [illegible] Checked by [illegible]

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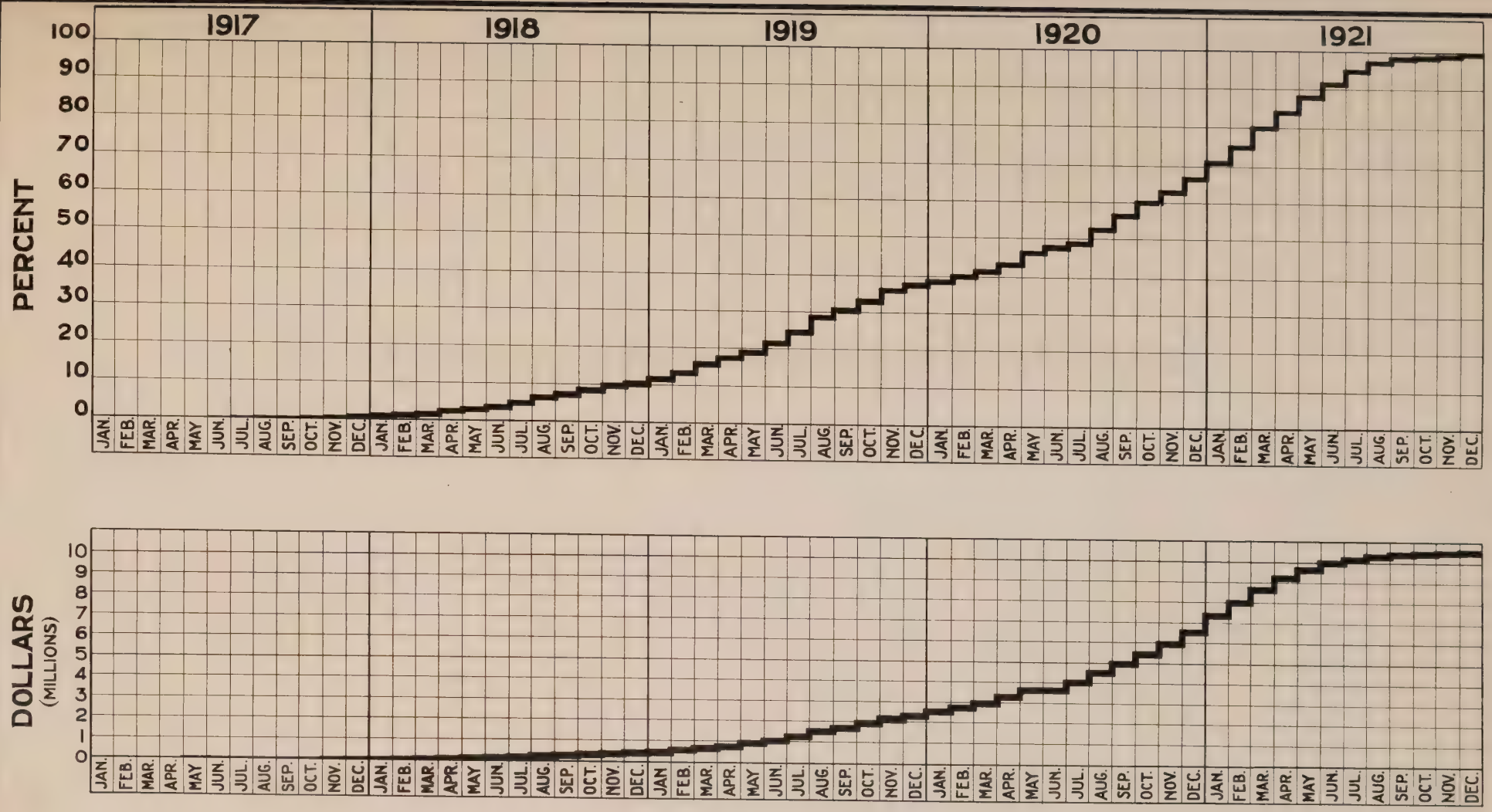
(J-182)



HYDRO-ELECTRIC INQUIRY COMMISSION

W. D. GREGORY, CHAIRMAN

QUEENSTON-CHIPPAWA POWER DEVELOPMENT

PROGRESS CHART FOR EARTH EXCAVATION IN INTAKE, CANAL, FOREBAY AND POWER HOUSE

Toronto, May 3rd, 1923. Made by W.S.D. Checked by W.J.F.

WALTER J. FRANCIS & COMPANY

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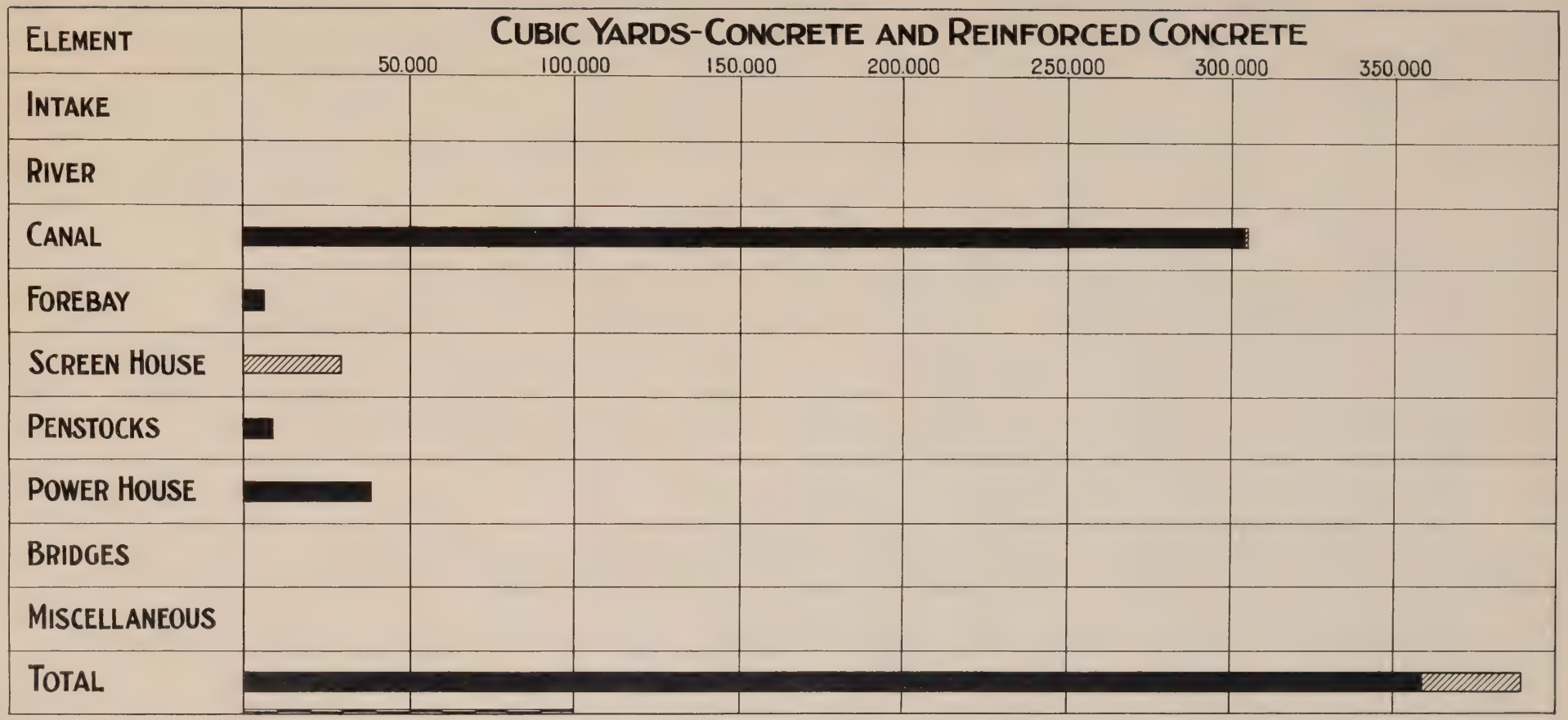

CONCRETE

REINFORCED CONCRETE

HYDRO-ELECTRIC INQUIRY COMMISSION

W. D. GREGORY, CHAIRMAN

QUEENSTON-CHIPPAWA POWER DEVELOPMENT

DISTRIBUTION CHART OF CONCRETE WORK IN CANAL AND FOREBAY

Toronto, May 3rd, 1923. Made by C.B.B. Checked by W.D.G.

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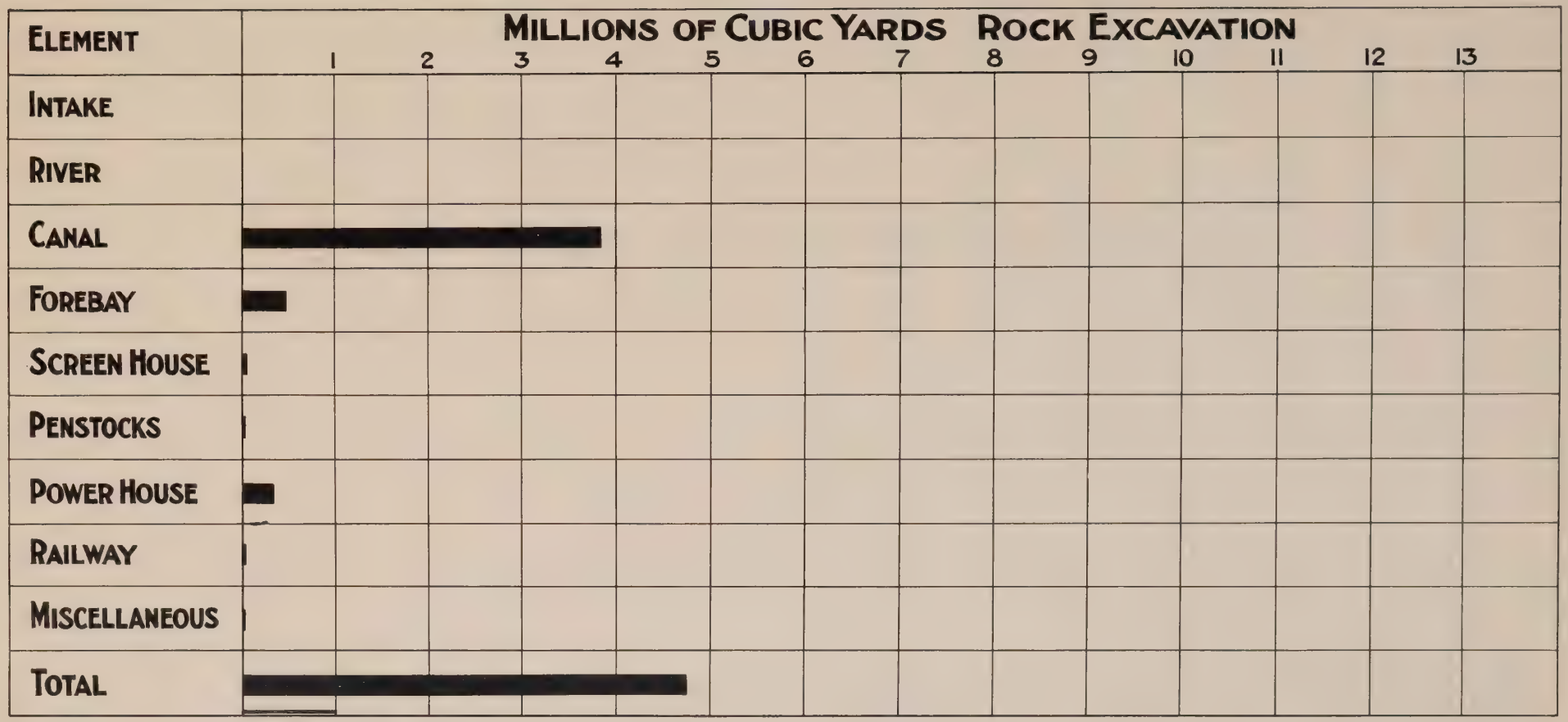
(J-180)



HYDRO-ELECTRIC INQUIRY COMMISSION

W. D. GREGORY, CHAIRMAN

QUEENSTON-CHIPPAWA POWER DEVELOPMENT

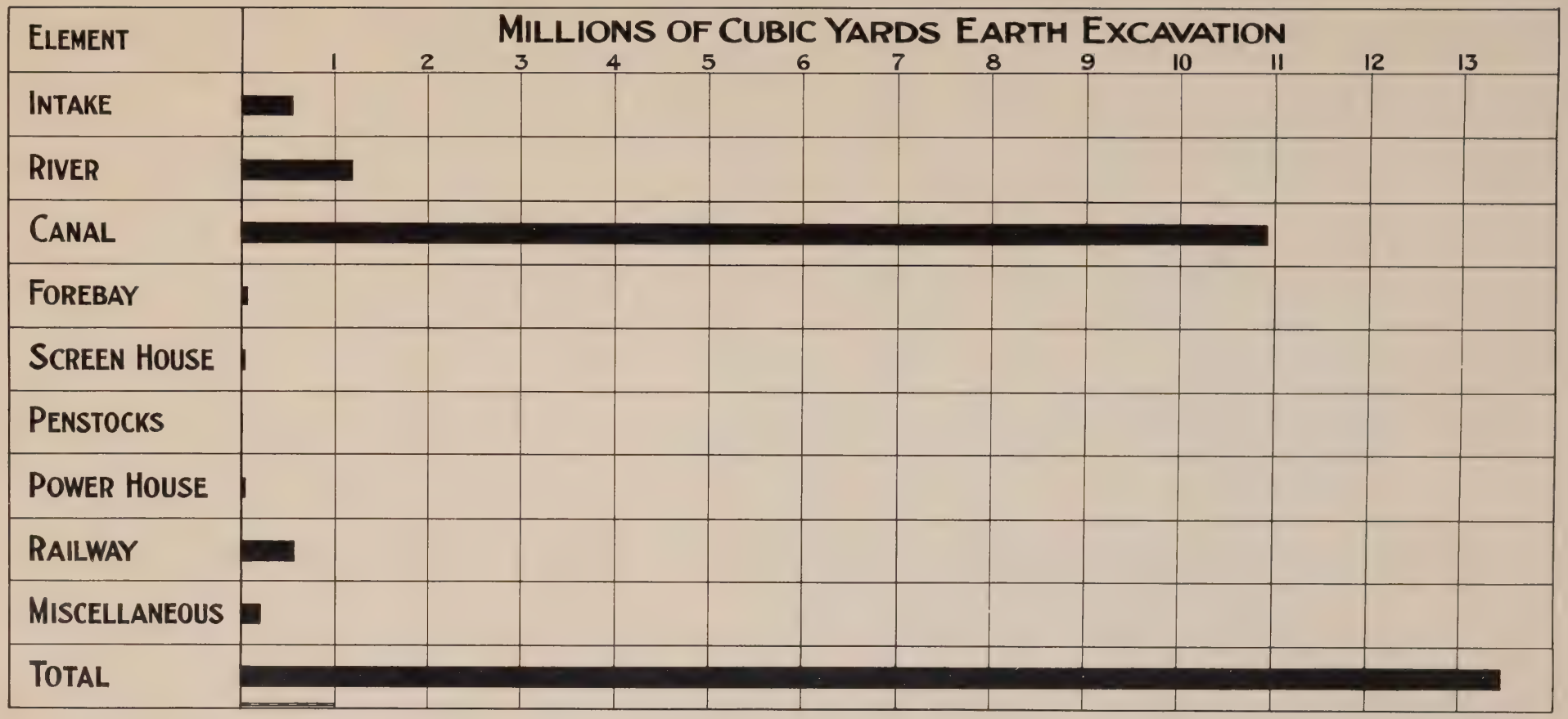
DISTRIBUTION CHART OF ROCK EXCAVATION IN CANAL AND FOREBAY

Toronto, May 3rd, 1923. Made by G.E.B. Checked by W.D.G.

WALTER J. FRANCIS & COMPANY

CONSULTING ENGINEERS

(J-179)



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W. D. GREGORY, CHAIRMAN

QUEENSTON-CHIPPAWA POWER DEVELOPMENT

DISTRIBUTION CHART OF EARTH EXCAVATION IN CANAL AND FOREBAY

Toronto, May 3rd, 1923. Made by G.B.B. Checked by W.J.F.

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(J-178)

(28) - Under the title "Electrical Generation and Proportion of Superstructure" is included all the electrical generating apparatus up to and including the 12,000-volt bus bars, together with all the concrete in the walls and roof of the generator room, fifty per cent. of the walls and roof of the control room, and fifty per cent. of the switching room. The remainder of the superstructure is charged against the capital cost of the Niagara System of which it is considered an integral part being a transformer station, and not against the Queenston-Chippawa Power Development. The total of item 28 is $3,214,413.15.

Three diagrams are included herewith as pages J-178, J-179 and J-180, to show the distribution of the earth work, the rock work and the concrete work according to the elements of the development. As supplementary information three other diagrams are included to show the progress of the work, J-181 being the Progress Chart for Earth Excavation in Intake, Canal, Forebay and Power House, J-182 being the Progress Chart for Rock Excavation in Canal, Forebay and Power House, and J-183 being the Progress Chart for Concrete Work in Canal and Forebay.

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Walter J. Francis

Consulting Engineer.

Toronto, May 3rd, 1923.

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